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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/692,725	10/19/2000	Saligrama R. Venkatesh	2810	5618

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EXAMINER

PIERRE, MYRIAM

ART UNIT	PAPER NUMBER
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2654

DATE MAILED: 06/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/692,725

Applicant(s)

VENKATESH ET AL.

Examiner

Myriam Pierre

Art Unit

2654

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-51 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 10-51 is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 October 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>09/10/2002</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Drawings

1. Figure 1 should be designated by a legend such as –Prior Art-in order to distinguish between the previous and current illustrations. Corrected drawings in compliance with 37 CFR 1.121 (d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Finn (WO 98/56208).

As to claim 1 Finn teaches

Art Unit: 2654

a microphone for receiving the spoken voice and the ambient noise for necessarily converting the spoken voice and the ambient noise into an audio signal (page 6 lines 20-25, page 8 lines 23-24, page 12 lines 1-10).

a speech enhancement (acoustic echo cancellation) filter for removing the second component from the audio signal to provide a filtered audio signal, said speech enhancement filter removing the second component by processing the audio signal (acoustic echo cancellation, page 5 lines 12-18; acoustic echo cancellation removes second component (noise) from fed back and processes the audio signal (determining received spoken voice)); and

a loudspeaker for outputting a clarified voice in response to the filtered audio signal (col. 12 line 5, Fig. 1 elements 85 and 75).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Finn (WO 98/56208) in view of Cheng et al. (2003/0018471).

As to claim 2 Finn does not teach psychoacoustics.

However, Cheng et al. teach one of the elements of psychoacoustics taken into account is necessarily that the human ear perceives sound at different frequencies on a non-linear mel-scale (mel frequency scale, page 3 paragraph

Art Unit: 2654

24, Mel-scale takes into account psychoacoustics which necessarily takes into account that the human ear perceives sound at different frequencies on a necessarily non-linear mel-scale).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to implement the psychoacoustics to sufficiently scale or reduce noise for perceptual frequencies which result in lower computation requirements, as taught by Cheng et al., page 3 paragraph 24.

receive

As to claim 3,

Neither Finn nor Cheng et al. teach smoothing a spectrum over larger windows.

However, Official Notice is taken that smoothing a spectrum is a well-known technique in Wiener filter design, therefore, it would have been obvious to one of ordinary skill in the art to smooth audio signals over larger windows at higher frequencies in order to minimize spectral leakage; thus preserving both the temporal characteristics as well as the frequency characteristics of an audio signal for further processing.

As to claim 4, Finn does not teach speech is anti-causal and noise is causal.

However, Cheng et al. teach one of the elements of psychoacoustics taken into account is that speech is anti-causal and noise is causal (non-causal finite impulse response, page 4 paragraph 34, non-causal finite impulse

Art Unit: 2654

response applies to the filter which convolutes the noisy audible signal and the non-causal finite impulse response, thus the non-causal impulse response is necessarily applied to speech and causal to noise).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to design noise as causal, and thus speech as the antithesis of causality, in order to capture all of the noise elements for removal or cancellation, thus enhancing the noise cancellation process and improving speech intelligibility.

6. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Finn (WO 98/56208) in view of Cheng et al. (2003/0018471), as applied to claim 4 above, in further view of Nelson et al. (5,949,894).

As to claim 5,

Neither Finn nor Cheng et al. explicitly teach filtering the audio signal with a causal filter.

However, Nelson et al. teach

speech enhancement filter takes one element into account by filtering the audio signal with a causal filter (impulse response of filter is constrained to be causal, col. 3 lines 32-35).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to design a causal filter in order to minimize the time averaged squared error between the filter output and the "desired" filter output, as taught by Nelson et al. col. 3 lines 33-35.

Art Unit: 2654

As to claim 6,

Neither Finn nor Cheng et al. teach filtering with a causal Wiener filter.

However, Nelson et al. teach causal filter is a causal Wiener filter (col. 3 lines 32-35, col. 3 line 32 and Fig. 17).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to implement filtering with a causal Wiener filter in order to minimize the time averaged squared error between the filter output and the "desired" filter output, as taught by Nelson, col. 3 lines 34-35.

As to claim 7, Neither Finn nor Cheng et al. teach Wiener calculations via weighted least squares.

However, Nelson et al. teach Wiener calculations via weighted least squares (col. 3 lines 28-33 and col. 4 line 57).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art at the time of the invention to implement Wiener calculations via weighted least squares in order to in order to minimize the time averaged squared error between the filter output and the "desired" filter output, as taught by Nelson, col. 3 lines 34-35.

Neither Finn nor Cheng et al. teach weighted least squares as an inverse proportional to an energy in a respective frequency bin.

However, Nelson et al. suggests weighted least squares as an inverse proportional to an energy in a respective frequency bin (inverse filtering using a least squares formula, col. 3 lines 26-30).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to implement the weighted least square as the inverse proportional to an energy in a frequency bin in order to restore the signal for further processing.

7. Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Finn (WO 98/56208) in view of Cheng et al. (2003/0018471), as applied to claim 1 above, in further view of Johnson (6,415,253).

As to claim 8,

Neither Finn nor Cheng et al. teach temporal smoothing of a Wiener filter calculation.

However, Johnson suggests speech enhancement filter uses temporal (broad) smoothing of a Wiener filter calculation (frequency spectrum components are filtered using a broad smoothing filter for silent state, smoothing coefficients used for the Wiener filter, col. 4 lines 33-35 and 65-67).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to implement temporal smoothing in order to reduce the peaks in the noise spectrum caused by the random nature of noise, as taught by Johnson, col. 4 lines 34-36.

As to claim 9, Neither Finn nor Cheng et al. teach frequency smoothing of a Wiener filter calculation.

However, Johnson teaches speech enhancement filter uses frequency (narrow) smoothing of a Wiener filter calculation (narrow smoothing for speech state, col. 4 lines 37-41).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to implement frequency smoothing in order to avoid smoothing the peaks in the spectrum because it represents voice characteristics and not random fluctuations, thus, the frequency spectrum components are filtered using a narrow smoothing filter, col. 4 lines 38-41.

Allowable Subject Matter

8. Claims 10-51 are allowed over the prior art of record. The following is an examiner's statement of reasons for allowance:

As to claims 10, 13, 16, 25, 37, 40 and 49, Finn (WO 98/56208) teaches filtering.

Finn does not teach nor fairly suggest an enhancement filter for smoothing spectrums comprising of a mel-scale, a causal Wiener and a third filter for temporal smoothing of the Wiener filter, as well as a speech enhancement filter, which removes the first and second components by taking into account the psychoacoustics of a human ear.

Art Unit: 2654

The dependent claims 11-12, 14-15, 17-24, 26-27, 38-39, 41-48, and 50-51 are allowed because they further limit the independent claims or their parent claims.

As to claims 28, 37, 40, and 49.

Finn (WO 98/56208) teaches echo cancellation but does not teach nor fairly suggest echo cancellation for removing the third filter component, which includes the first and second audio signals, as well as the speech enhancement filter also removing the first and second components by taking into account the psychoacoustics of a human ear.

The dependent claims 29-36, 38-39, 41-48, and 50-51 are allowed because they further limit the independent claims or their parent claims.

9. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

10. The following art made of record and not relied upon is considered pertinent to applicant's disclosure Balan et al. (6,343,268), Hamabe et al. (5,426,703); and Mokbel et al. (5,864,806).

Balan et al. teach forward and backward Wiener filtering. Hamabe et al. teach regenerating noise elimination.

Mokbel et al. teach Mel-scale filterbanks for high-frequency signals.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Myriam Pierre whose telephone number is 571-272-7611. The examiner can normally be reached on 8:30-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on 703-308-9645. The fax phone number for the organization where this application or proceeding is assigned is 703872-9306.


12. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private

Art Unit: 2654

PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197

(toll-free).

04/06/2005



RICHEMOND DORVIL
SUPERVISORY PATENT EXAMINER